MATH 54 FALL 2017: DISCUSSION 205/208 QUIZ#11

GSI: CHRISTOPHER EUR, DATE: 11/13/2017

STUDENT NAME: _____

Problem 1. Let $A = \begin{bmatrix} 3 & 2 & 2 \\ 2 & 3 & -2 \end{bmatrix}$.

(a) (4 points) Given that A^TA has eigenvalues 25, 9, and 0, find orthogonal diagonalization of A^TA.

(b) (3 points) Find the SVD of A.

(c) (extra point) Let $S = \{\vec{x} \in \mathbb{R}^3 \mid \|\vec{x}\|^2 \leq 1\}$ be the unit ball in $\mathbb{R}^3$. Find the area of the image $A(S)$ using the fact that an ellipse with major and minor diameters $2a$ and $2b$ has area πab.

Problem 2. (3 points) Let B be a symmetric $n \times n$ matrix such that $B^2 = B$. Show that for any $y \in \mathbb{R}^n$, the vectors $y - By$ and By are orthogonal.